

CEA Table of Contents

1.0 EXECUTIVE SUMMARY

Figure 1. Location of Dewey-Burdock Project Area

Figure 2. The Dewey-Burdock Project Area

2.0 INTRODUCTION

Table 1. Areas the EPA Evaluated for Cumulative Effects and References to Document Sections Reviewed

3.0 IMPACTS TO USDWs

3.1 Potential Groundwater Consumption

3.1.1 Inyan Kara Aquifers

Table 2. Anticipated Project-Wide Injection Flow Rates Corresponding to Maximum Anticipated Gross Pumping Rates and Bleed Rates (without Groundwater Sweep)

Table 3. Anticipated Inyan Kara Aquifer Water Usage (in gpm) during Concurrent Operation and Restoration

(from Table 5.6-1: Typical Inyan Kara Water Usage in the Large Scale Mine Permit Application)

Table 4. Maximum Estimated Inyan Kara Usage (in gpm) and Requested Appropriation Volume (in gpm) (from Table 2-1 in Powertech's Report to Accompany Inyan Kara Water Right Permit Application)

3.1.2 Madison Aquifer

Table 5. Anticipated Madison Aquifer Water Usage (in gpm) during Concurrent Operation and Restoration

(Table 5.6-2: Typical Madison Water Usage from Large Scale Mine Permit Application)

Table 6. Maximum Estimated Madison Usage (in gpm) and Requested Appropriation Volume (in gpm) (from Table 2-1 in Powertech's Report to Accompany Madison Water Right Permit Application)

3.2 Potential Drawdown of Aquifer Potentiometric Surface

3.2.1 Inyan Kara Aquifers

3.2.1.1 Impacts to Inyan Kara Aquifers within the Dewey-Burdock Project Boundary

Figure 3. An Example of a Replacement Water Supply Well.

3.2.1.2 Impacts to Inyan Kara Aquifers outside the Dewey-Burdock Project Boundary

Figure 4. Expected Drawdown of the Fall River Aquifer Potentiometric Surface and Downgradient Fall River Private Drinking Water Wells.

Figure 5. Expected Drawdown of the Chilson Aquifer Potentiometric Surface and Chilson Private Drinking Water Wells.

3.2.2 Madison Limestone

3.3 Potential Groundwater Quality Impacts

3.3.1 Potential Impacts to Ore Zone Groundwater Quality

3.3.2 Potential Impacts to Inyan Kara Groundwater Quality Outside of the Ore Zone

3.3.2.1 Excursion Control

3.3.2.2 Post-restoration Monitoring of Wellfields

3.3.3 Potential Impacts to Overlying or Underlying Aquifers

3.3.4 Effects of Storage Ponds for Treated and Untreated Water on Groundwater Quality

Figure 6a. Location of Dewey Area Ponds for the Deep Injection Well Disposal Method from Large Scale Mine Permit Application Appendix 5.3-A Pond Design Report Figure 4.6-1

Figure 6b. Location of Dewey Area Ponds for the Land Application Disposal Method From Large Scale Mine Permit Application Appendix 5.3-A Pond Design Report Figure 3.7-1

Figure 7a. Location of Burdock Area Ponds for the Deep Injection Well Disposal Method From Large Scale Mine Permit Application Appendix 5.3-A Pond Design Report Figure 4.6-1

Figure 7b. Location of Burdock Area Ponds for the Land Application Disposal Method

From Large Scale Mine Permit Application Appendix 5.3-A Pond Design Report Figure 3.7-1

3.3.4.1 Dewey Area Analysis

Figure 8a. Dewey Area Pond Locations for the Deep Injection Well Disposal Method and the Surface Geology from Class III Permit Application Figure 6.3

Figure 8b. Dewey Area Pond Locations for the Land Application Disposal Method and the Surface Geology from Class III Permit Application Figure 6.3

Figure 9a. Dewey Area Pond Locations for the Deep Injection Well Disposal Method and UIC Class III Permit Application Figure 4.2 Dewey-Burdock Drillhole Map

Figure 9b. Dewey Pond Locations for the Land Application Disposal Method and UIC Class III Permit Application Figure 4.2 Dewey-Burdock Drillhole Map

Figure 10. Dewey Pond Locations for the Land Application Disposal Method, the Dewey-Burdock Drillhole Map and Class III Permit Application Figure 4.7 Area where Fall River Potentiometric Surface is above Ground Surface

Figure 11. Location of the Alkali Area

3.3.4.2 Burdock Area Analysis

Figure 12a. Burdock Area Pond Locations for the Deep Disposal Well Disposal Method and Surface Geology from Class III Permit Application Figure 6.3

Figure 12b. Burdock Area Pond Locations for the Land Application Disposal Method and Surface Geology from Class III Permit Application Figure 6.3

Figure 13a. Burdock Area Pond Locations for the Deep Disposal Well Disposal Method and Alluvium Isopach Map (Plate 3.6-4 from the GPD Application Submitted to the South Dakota DENR)

Figure 13b. Burdock Area Pond Locations for the Land Application Disposal Method and Alluvium Isopach Map (Plate 3.6-4 from the GPD Application Submitted to the South Dakota DENR).

Figure 14a. Burdock Area Pond Locations for the Deep Injection Well Disposal Method and UIC Class III Permit Application Figure 4.2 Dewey-Burdock Drillhole Map

Figure 14b. Burdock Area Pond Locations for the Land Application Method and UIC Class III Permit Application Figure 4.2 Dewey-Burdock Drillhole Map

3.3.5 Potential Groundwater Impacts from Spill and Leaks

3.4 Potential Subsidence in ISR Wellfields

3.5 Summary of Mitigation Measures to Prevent Groundwater Impacts

4.0 IMPACTS TO SURFACE WATER AND WETLANDS

4.1 Surface Water and Stormwater Permitting Requirements

4.2 The Large Scale Mine Permit Water Management and Erosion Control Plan

4.2.1 Erosion Control

4.2.2 Sediment Control Plan

Table 7. List and Description of Plates

Table 8. Sediment Structures Planned for Use at the Dewey-Burdock Project Site and Corresponding Drainage Basin Acreage.

4.2.3 Diversion Channels

4.3 Potential Impacts from Floods at the Dewey-Burdock Project

4.3.1 Powertech's Flood Analysis

4.3.2 Historic Flood Events in Western South Dakota

Table 9. Number of Flood Reports on the National Weather Service Website for Western South Dakota from 1996 through 2013.

4.4 Potential Impacts to Stream Channels and Riparian Areas

4.5 Potential Impacts to Wetlands

Figure 15a. Location of Jurisdictional Wetland in the Dewey Area (from NRC SEIS Figure 4.5-1)

Figure 15b. Location of Jurisdictional Wetland in the Burdock Area (from NRC SEIS Figure 4.5-1)

4.6 Potential Surface Water Quality Impacts from Spills and Leaks

4.7 Impacts from Deep Injection Well and Land Application Disposal Options for Treated ISR Waste Fluids

4.7.1 Impacts from the Deep Disposal Well Option

4.7.2 Impacts from the Land Application Option

Table 10. Breakdown of Land Disturbance for the Deep Injection Well and Land Application Disposal Options at the Proposed Dewey-Burdock ISR Project Site (from the NRC SEIS Table 4.2-1)

4.8 Summary of Mitigation Measures to Prevent or Minimize Potential Impacts to Surface Water and Wetlands

5.0 IMPACTS FROM SPILLS AND LEAKS

5.1 Pipelines

5.2 Header Houses and Wellheads

5.2.1 Header Houses

5.2.2 Wellheads

5.2.3 Wellfield Leak Monitoring and Detection

Figure 16. Injection wellhead design diagram.

Figure 17. Production wellhead design diagram.

5.2.4 Control of Wellfield Spills and Leaks

5.3 Central Processing Plant and Satellite Facility

5.4 Deep Well Pump and Wellhead Houses

5.5 Transportation Accidents

5.5.1 Yellowcake Shipments

5.5.2 Ion-Exchange Resin

5.5.3 Process Chemicals and Fuel

5.5.4 11e.(2) Byproduct Material

5.6 Treatment and Storage Ponds

5.7 Potential Impacts from Spills and Leaks

Figure 18. Map Showing Surface Geologic in the Burdock Area.

Figure 19. A Portion of Class III Permit Application Cross Section B-B' in Burdock Wellfield 6 at the Fall River Outcrop Area.

Figure 20. A Portion of Class III Permit Application Cross Section F-F' between Burdock Wellfields 7 and 8 at the Fall River Outcrop Area.

Figure 21. Locations Wells Completed in the Fall River Aquifer in Section 2, T7S, R1E.

5.8 Summary of Prevention and Mitigation of Potential Impacts from Spills and Leaks

6.0 IMPACTS TO LANDS USE

Figure 22. The Area of Expected Land Disturbance within the Dewey-Burdock Project Area

Table 11. Breakdown of Land Disturbance for the Class V Injection Well and Land Application Disposal Options at the Proposed Dewey-Burdock In-Situ Recovery Project (Table 4.2-1 in NRC's SEIS)

7.0 IMPACTS TO SOILS

7.1 Impacts to Soils during Construction Activities

7.2 Impacts to Soils during ISR Operations

7.3 Operations Impacts Resulting from the Land Application Disposal Method for Treated ISR Waste Fluids

7.4 Aquifer Restoration Phase Impacts

7.4.1 Aquifer Restoration Phase Impacts from the Deep Injection Well Disposal Method

7.4.2 Aquifer Restoration Phase Impacts from Land Application Disposal Method

7.5 Decommissioning Phase Impacts

7.5.1 Decommissioning Impacts from Deep Injection Well Disposal Method

7.5.2 Decommissioning Impacts from Land Application Disposal Method

7.6 Mitigation of Potential Soil Impacts

7.7 Conclusions

8.0 IMPACTS TO GEOLOGY

8.1 Impacts during Well Construction

8.2 Impacts during Well Operation

8.2.1 Impacts from Class III Injection Well Operation

8.2.2 Impacts from Deep Injection Well Operation

8.3 Aquifer Restoration Impacts

8.3.1 Impacts to Class III Well Injection Zones

8.3.2 Impacts to Deep Well Injection Zones

Table 12. Volume of Groundwater Produced as Bleed during ISR Production and Groundwater Restoration

8.4 Impacts to Geology during Decommissioning

8.5 Conclusions

9.0 POTENTIAL RADIOLOGICAL IMPACTS AND EFFLUENT CONTROL SYSTEMS

9.1 Potential Radiological Impacts

9.2 Effluent Control System

9.3 Radon

9.4 Radionuclide Particulates

9.5 Conclusions

10.0 IMPACTS TO AIR QUALITY

10.1 Clean Air Act Applicable Requirements

10.1.1 Criteria Pollutants –National Ambient Air Quality Standards

10.1.2 Hazardous Air Pollutants (HAPs)

10.1.3 Clean Air Act Permitting

10.1.3.1 Criteria Pollutants and Ambient Air Quality Standards

10.1.3.2 Air Quality Designation

Table 13. The National Ambient Air Quality Standards

10.1.3.3 Existing Ambient Air Quality

Table 14. The Ambient Air Quality at the Dewey-Burdock Project Site

10.1.3.4 PSD Increments

Table 15. PSD Class I and Class II Standards (40 CFR 52.21(c))

Figure 23. The location of the Dewey-Burdock Project Area relative to Wind Cave National Park and Badland National Park Class 1 areas.

10.1.3.5 Air Quality Related Values

10.2 Air Quality Impacts at the Dewey-Burdock Project Site: Introduction and Summary

10.2.1 Emission Inventories

Table 16. Total* (Peak Year) Nonradiological Emission Mass Flow Rate (Metric Tons[†] Per Year) Estimates for All Phases and Sources (SEIS Table 2.1-5)

Table 17. Nonradiological Combustion Emission Estimated Mass Flow Rates (Metric Tons* Per Year) from Stationary Sources at the Dewey-Burdock Project Site[†] (SEIS Table 2.1-1)

Table 18. Nonradiological Combustion Emission Mass Flow Rate Estimates (Metric Tons per Year) from Mobile Sources for Various Phases of ISR Operations (SEIS Table 2.1-2)

Table 19. Total* (Peak Year) Fugitive Dust Mass Flow Rate (Metric Tons[†] per Year) Estimates for All Phases and Sources[‡] (SEIS Table 2.1-3)

10.2.2 Potential to Emit Criteria Pollutants

Table 20. Potential Emissions Summary in tons per year (Table 4-1 in DENR's *Statement of Basis*)

10.2.3 New Source Review Permits

10.3 South Dakota DENR Review of Powertech's Title V Permit Application

Table 21. Powertech's Proposed Stationary Source Units (Table 1-1 in the DENR Statement of Basis)

10.3.1 New Source Performance Standard (NSPS)

10.3.2 National Emission Standard for Hazardous Air Pollutants - Maximum Achievable Control Technology (40 CFR part 63)

10.3.2.1 Potential Hazardous Air Pollutant Emissions

Table 22. Potential Emissions Summary for Reciprocating Internal Combustion Engines in tons per year (Table 6-1 in DENR's *Statement of Basis*)

10.3.2.2 ARSD 74:36:08:40 - 40 CFR 63, Subpart ZZZZ

10.3.3 National Emission Standards for Hazardous Air Pollutants (40 CFR part 61)

10.4 The Nuclear Regulatory Commission Evaluation of Dewey-Burdock Project Impacts to Air Quality

10.4.1 Modeling of Emission Impacts on Air Quality: Modeling Protocol and Methodology

10.4.2 Air Modeling Results

10.4.2.1 Results from AERMOD Model

Table 23. Nonradiological Concentration Estimates (i.e., AERMOD Modeling Results) From Stationary, Mobile, and Fugitive Sources for the Peak Year* Compared to the National Ambient Air Quality Standards (NAAQS) (SEIS Table 4.7-1)

Table 24a. Nonradiological Concentration Values From Stationary, Mobile, and Fugitive Sources for the Peak Year* Compared to the Class I and Class II Increments (SEIS Table 4.7-2)

Table 24b. Nonradiological Concentration Values From Stationary, Mobile, and Fugitive Sources for the Peak Year* Compared to the Class I Increments (IML Report)

Figure 24. An isopleth map of the predicted maximum 24-hr concentrations attributable to the Dewey-Burdock Project. (Figure 6-5 from the IML Report)

Table 25. Summary of Predicted Near-field Pollutant Concentrations from the AERMOD Model (IML Report Table 6-1)

10.4.2.2 Increment Comparison

10.4.2.3 Results from CALPUFF Model: AQRVs

10.4.2.4 Visibility Analysis Results

Table 26. Visibility Modeling Results for the Peak Year at Wind Cave National Park (SEIS Table 4.7-3)

10.4.2.5 AQRV Modeling Results: Nitrogen and Sulfur Deposition Analysis

Table 27. Total (Wet and Dry) Nitrogen and Sulfur Deposition Modeling Results for the Peak Year* at Wind Cave National Park (SEIS Table 4.7-4)

10.5 Greenhouse Gases

Table 28. Annual Carbon Dioxide Estimates in Metric Tons/Year * for the Proposed Action (SEIS Table 2.1-6)

10.6 Conclusions

10.6.1 List of Mitigation Measures Proposed by Powertech

10.6.2 List of Additional Mitigation Measures Identified by the NRC

11.0 CLIMATE CHANGE IMPACTS

11.1 Global Impacts from Climate Change

11.2. Local Effects of Climate Change

11.3 Sources of Greenhouse Gases Related to the Dewey-Burdock Project Site

Table 29. Annual Carbon Dioxide Estimates in Metric Tons/Year * for the Proposed Action (SEIS Table 2.1-6)

11.3.1 Estimated CO₂ Emissions from Electrical Power Consumption

Table 30. Annual Estimated CO₂ Emissions from Electrical Power Consumption

Figure 25. Projected Construction, Operation and Decommissioning Schedule at the Dewey-Burdock Project Site

11.3.2 Estimated CO₂ Emissions from Mobile Sources including Transportation

Table 31. Total Estimated CO₂ Emissions from Mobile Sources for Each Project Year and for the Life of the Project

11.3.3 Estimated CO₂ Emissions from Stationary Sources

Table 32. Estimated CO₂ Emissions from Stationary Sources

11.3.4 Estimated CO₂ Emissions from Yellowcake Production

Table 33. Estimated CO₂ Emissions from Yellowcake Production

11.3.5 Total Estimated CO₂ Emissions Calculated for the Life of the Project

Table 34. Total Estimated CO₂ Emissions Calculated for the Life of the Project

11.4 Uranium Processing

11.5 Nuclear Power Plant Operation

11.6 Climate Change and Adaptation

11.7 Climate Change and Mitigation

11.7.1 Powertech's Proposed Mitigation Measures to Reduce Greenhouse Gas Emissions

11.7.2 Potential Mitigation Measures to Protect Groundwater

11.7.3 Potential Mitigation Measures to Protect Surface Water

11.8 Conclusions

12.0 TRANSPORTATION IMPACTS

Figure 26. Public Roads Providing Access to the Dewey-Burdock Project Site

Figure 27. Map Showing the Location of the Dewey Road

Figure 28 The Fall River and Custer County Portion of the South Dakota 2014 Statewide Traffic Flow Map

Table 35. Estimated Daily Vehicle Round-Trips for the Proposed Dewey-Burdock In-Situ Recovery Project Waste Management Options (from SEIS Table 2.1-7)

12.1 Transportation Impacts during the Construction Phase

Table 36. Estimated Daily Traffic on Regional Roads for the Construction Phase of the Proposed Dewey-Burdock *In-Situ* Recovery Project (Table 4.3-1 from the NRC SEIS)

12.2 Transportation Impacts during the Operation Phase

Table 37. Estimated Daily Traffic on Regional Roads for the Operations Phase of the Proposed Dewey-Burdock *In-Situ* Recovery Project (Table 4.3-2 from the NRC SEIS)

12.3 Transportation Impacts during the Aquifer Restoration Phase

Table 38. Estimated Daily Traffic on Regional Roads for the Aquifer Restoration Phase of the Proposed Dewey-Burdock *In-Situ* Recovery Project (from Table 4.3-3 of the NRC SEIS)

12.4 Transportation Impacts during the Decommissioning Phase

12.5 Conclusions

13.0 IMPACTS FROM POTENTIAL ACCIDENTS

13.0 IMPACTS FROM POTENTIAL ACCIDENTS

13.1 Transportation Accidents

13.1.1 Yellowcake Shipments

13.1.2 Accidents with Resin-hauling Trucks

13.2 Other Types of Potential Accidents

14.0 IMPACTS TO ECOLOGICAL RESOURCES

14.1 Federally-listed Threatened and Endangered Species Evaluated under the Endangered Species Act

14.2 Species of State and Tribal Interest: The Short-Horned Lizard

14.3 Tribal Concerns about Impacts to Vegetation

14.4 Proposed Mitigation Measures

15.0 IMPACTS FROM WASTE MANAGEMENT

15.1 Waste Disposal Methods

15.2 Waste Disposal during Construction

Figure 27. Projected Construction, Operation and Decommissioning Schedule at the Dewey-Burdock Project Site.

15.3 Waste Disposal during Operations

15.3.1 Liquid Byproduct Material during Operations, Deep Injection Well Disposal Option

15.3.2 Liquid Byproduct Material during Operations, Land Application Disposal Option

15.3.3 Solid Byproduct Material during Operations, Deep Injection Well Disposal Option

15.3.4 Solid Byproduct Material during Operations, Land Application Disposal Option

15.3.5 Nonhazardous Solid Wastes during Operations

15.3.6 Hazardous Solid Wastes during Operations

15.4 Waste Disposal during Aquifer Restoration

15.4.1 Liquid Byproduct Material during Aquifer Restoration, Deep Injection Well Disposal Option

15.4.2 Liquid Byproduct Material during Aquifer Restoration, Land Application Disposal Option

15.4.3 Solid Byproduct Material during Aquifer Restoration, Deep Injection Well Disposal Option

15.4.4 Solid Byproduct Material during Aquifer Restoration, Land Application Disposal Option

15.4.5 Nonhazardous Solid Wastes during Aquifer Restoration

15.4.6 Hazardous Solid Wastes during Aquifer Restoration

15.5 Waste Disposal during Decommissioning

15.5.1 Byproduct Waste from Decommissioning

15.5.2 Nonhazardous Solid Waste from Decommissioning

15.5.3 Hazardous Waste from Decommissioning

15.5.4 Disposal Via Combination of Class V Injection and Land Application

15.6 Conclusions on Waste Management Impact Analysis

16.0 CONCLUSIONS

Table 39. Areas where the EPA Evaluated Impacts Potentially Resulting from the Drilling and Operation of Injection Wells Authorized under UIC Area Permit.